DEPARTMENT OF EDUCATION AND SCIENCE

The Collection of Residue Data

A Report by the Advisory Committee
on Pesticides and Other Toxic Chemicals
covering a Report by its Working Party
on the Collection of Residue Data

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TERMS OF REFERENCE OF THE COMMITTEE

'To keep under review all risks that may arise from the use of:

1. pesticides;
2. potentially toxic chemicals on sale to farmers for veterinary use and veterinary medicines prescribed for use by veterinary surgeons; and
3. any other potentially toxic chemical specifically referred to the Committee by Ministers,

and to make recommendations to the Ministers concerned.'

I. REPORT, BY THE ADVISORY COMMITTEE ON PESTICIDES AND OTHER TOXIC CHEMICALS, ON THE COLLECTION OF RESIDUE DATA

Introduction

1. As part of our Review of the Present Safety Arrangements for the Use of Toxic Chemicals in Agriculture and Food Storage*, we considered the need to limit, either by recommendation or by law, the amount of residues in crops and in foodstuffs of active ingredients of pesticide and veterinary products. During the review, it became increasingly obvious that before recommendations on residue limits could be made, many more data on existing residues were needed and that these could only be obtained by the sampling and analysis of a wide range of home produced and imported food. We therefore set up a Working Party on the Collection of Residue Data to examine the problems that arose in getting this information. The terms of reference of the Working Party are given in full in paragraph 9 of its report which is annexed as Part II.

2. In our Report of the Review of the Present Safety Arrangements* we recommended (paragraph 165) that when sufficient data were available tentative residue limits for an active ingredient in various foodstuffs should be laid down for the guidance of all concerned if the data suggested that they were necessary. We also recommended that when these tentative limits had been in existence for a reasonable period, further consideration should be given, in the light of all the factors operating at that time—including the import position—to the need to transform the tentative limits into statutory tolerances by means of regulations under Section 4 of the Food and Drugs Acts. This note and the report of the Working Party concern themselves with the information needed to establish beyond reasonable doubt residue limits which are not only safe to the consumer but are consistent with good agricultural practice. Such limits must also take account of variations in soil and weather conditions. The note and the report do not concern themselves with the desirability or otherwise of making such residue limits compulsory.

Agreed Analytical Procedures

3. Paragraph 32 of the Working Party's report draws attention to the need for improved methods of analysis for residues of certain active ingredients. It is clearly very desirable to develop and agree acceptable methods for all active ingredients for which residue limits are drawn up. Acceptable analytical methods for some active ingredients have already been agreed and work on others is being done both in Great Britain and internationally. We appreciate the difficulties involved; it takes time to get expert agreement on the merits of different methods and, in any case, developments in analytical techniques may make a method out of date in a fairly short time. Further there may be more than one method perfectly adequate for the purpose in view. We consider,

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* 'Review of the Present Safety Arrangements for the Use of Toxic Chemicals in Agriculture and Food Storage'. Report of the Advisory Committee on Pesticides and Other Toxic Chemicals. H.M.S.O., 1967.

however, that accepted methods of analysis for all active ingredients involved are an important corollary of any scheme for establishing residue limits and *recommend* that the Government should do all it can to encourage the use of accepted methods of analysis where this is practical.

Existing data

4. Paragraphs 50 and 51 of the Working Party's report comment on the availability of published and unpublished data which would help in a proper consideration of residue limits for a large number of existing active ingredients. The extraction of such data, their classification and presentation in a suitable form would be a long and laborious task, involving the examination of published work and of Government records over a number of years. Before any data which were supplied in confidence under the terms of the Pesticides or Veterinary Products Safety Precautions Schemes could be used, the supplier's authority would also have to be obtained. In spite of these difficulties, we think it right in view of the extreme importance of using existing information to the full that Government Departments should assemble such data and we *recommend* that work to this end should be started as soon as possible. Industry should not be asked to supply data already available to Departments but should be asked to authorise the use of that information they have already provided and should be encouraged to contribute to any additional data required and to provide fresh data on backlog active ingredients where none are available.

Recommendations

5. We have carefully considered the Working Party's report and we endorse all the recommendations in paragraph 70.

6. In addition we recommend that:

(a) Government Departments should do all they can to encourage the development and agreement of standard methods of analysis of foodstuffs for residues of pesticide and veterinary products where such methods are practical;

(b) Government Departments should now assemble, to an agreed programme, published and unpublished data on levels in foodstuffs of residues of active ingredients of pesticide and veterinary products and should encourage the manufacturers and distributors of these products to assist in this task and to provide additional data.

Acknowledgments

7. We would like to express our thanks to those individuals and organisations who submitted written evidence to the Working Party and to the members and Secretary of the Working Party for their work in producing the report.

Andrew Wilson

(Chairman of Advisory Committee
on Pesticides and Other Toxic Chemicals)

March, 1968.

II. REPORT BY THE COMMITTEE'S WORKING PARTY ON THE COLLECTION OF RESIDUE DATA

Terms of Reference

1. The Working Party on the Collection of Residue Data was appointed by the Advisory Committee on Pesticides and Other Toxic Chemicals in July 1965, during its review of safety arrangements for the use of toxic chemicals in agriculture and food storage. This review was subsequently published in January 1967*. The membership of the Working Party is given in Appendix 1.

2. The terms of reference of the Working Party (*para. 166) were to consider and report on the following matters:

(a) the extent of existing facilities for sampling and analysing raw and processed foodstuffs, both home grown and imported, for residues of pesticide and veterinary products;

(b) the extent to which appropriate analytical methods are available;

(c) the basis for sampling, e.g. how many samples need to be taken, of what foodstuffs and when and where, to obtain sufficient data for a proper consideration of residue limits for particular pesticide and veterinary products;

(d) what additional sampling and analytical facilities and staff would be needed to obtain sufficient data for a proper consideration of residue limits for particular pesticide and veterinary products;

(e) the kind of organisation needed for a probably prolonged survey of a wide range of foodstuffs for residues of pesticide and veterinary products occurring in them.

General Background

3. In its review the Advisory Committee concluded (*para. 68) that for new pesticide and veterinary products submitted to the Pesticides or Veterinary Products Safety Precautions Schemes, the data provided by notifiers were sufficient to indicate whether or not a residue occurred and, if so, whether it was likely to be of any toxicological significance to consumers. The Advisory Committee also concluded that whilst these data might be acceptable for this purpose, they might be insufficient for arriving at a figure for the likely maximum residues which might occur in the course of commercial use of such a product throughout this country.

4. The Advisory Committee therefore recommended (*para. 70) that the notifier of a pesticide or veterinary product containing a new active ingredient, or requiring an increased dosage rate of a toxic and persistent, active ingredient, should be required to submit adequate and realistic data from which it would be possible to assess the maximum residues likely to occur in recommended practice and (*para. 71) that

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* 'Review of the Present Safety Arrangements for the Use of Toxic Chemicals in Agriculture and Food Storage'. Report of the Advisory Committee on Pesticides and Other Toxic Chemicals. H.M.S.O., 1967.

during the first few years of commercial use the notifier should still be under obligation, if required by the licensing authority, to collect and furnish further residue data under practical conditions of use.

5. The Advisory Committee appreciated (*para. 166) that for certain active ingredients in commercial use the essential need was for more residue data, but realised that the sampling and analysis involved in supplying them would be a large and continuous task. The first necessity was to estimate the extent of the existing facilities and of those which would be needed to obtain the essential data.

6. The evidence considered by the Advisory Committee also indicated that whilst there was a considerable body of opinion in support of the introduction of mandatory control of residue limits, there was doubt whether existing facilities could cope with the sampling and analytical work this would entail. The Committee concluded (*para. 165) that at this stage, and in the present state of knowledge, it would be wise not to embark on a system of statutory residue limits forthwith. The Committee recommended that when sufficient data were available tentative residue limits for an active ingredient should be laid down for the guidance of all concerned if the data suggested that they were necessary.

7. The Working Party is satisfied that the current arrangements under the Pesticides Safety Precautions Scheme and the Veterinary Products Safety Precautions Scheme give adequate protection for the consumer of foodstuffs treated in this country, *provided that the recommendations for use given on the label are observed by the users of the products*. For example, there have been no authenticated cases of harm caused to consumers in this country by residues derived from pesticide or veterinary products used as recommended.

8. The Working Party is of the opinion that residue limits in themselves offer no direct safeguard to the consumer but contribute to his safety because they encourage the user to ensure strict adherence to the recommended practice. They could act as useful criteria in detecting misuse and contamination and could also influence the extent of control in exporting countries over the use of pesticide and veterinary products on produce destined for Great Britain.

9. There are two approaches, both ultimately dependent on toxicological considerations, upon which a system of residue limits in foods could be founded:

(a) that based on the extent to which residues arise in the course of good agricultural practice;

(b) that based on a knowledge of dietary patterns and an acceptable daily intake of the active ingredient.

In considering its terms of reference the Working Party has kept in mind these two approaches and the above points from the Advisory Committee's review.

The extent of existing sampling and analytical facilities

10. To assist in obtaining information on this subject the Working Party, through the Ministry of Agriculture, Fisheries and Food issued a press notice on 22nd February 1966 (this notice is reproduced as Appendix 2). Copies of the notice, together with a

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covering letter inviting co-operation on specific points, were sent to all official laboratories which might be working on the problem of residues of pesticide and veterinary products, to Research Associations of the food industry, to certain University Departments, to organisations representing local government (including Public Analyst) interests, to the larger manufacturers and formulators of pesticide and veterinary products and to certain private and consulting analysts' laboratories. Copies of the notice were sent to 121 organisations; replies were received from the 94 organisations listed in Appendix 3.

11. The replies from 59 organisations indicated that they were actively engaged in investigating residues of pesticide or veterinary products in food. The kinds of investigations undertaken are summarised in Appendix 4. Only a small proportion of the samples examined is derived from imported foodstuffs.

12. No extensive sampling or analytical facilities unknown to the Advisory Committee were disclosed by the replies. Analysis of foodstuffs for residues is undertaken:

(a) to provide data in support of a notification under the Pesticides or Veterinary Products Safety Precautions Schemes;

(b) to obtain data on the general residue levels resulting from the commercial use of pesticide or veterinary products;

(c) to detect residues resulting from unapproved uses or accidental contamination;

(d) for the quality control of processed foodstuffs.

13. Samples analysed to obtain data in support of a notification under the Pesticides Safety Precautions Scheme and the Veterinary Products Safety Precautions Scheme come mainly from authorised trials by manufacturers or distributors in Great Britain. The samples are analysed in the firms' laboratories, in Great Britain or abroad, or by consultant analysts on the behalf of firms. This type of investigation accounts for about half of the work done in Great Britain on residues of pesticides or veterinary products in food. The presence, nature and origin of the residues in these samples are usually known to the analyst.

14. Three types of samples are examined for residues resulting from the commercial use of pesticide or veterinary products:

(a) those taken by local authorities under the Food and Drugs Act, 1955, and examined by Public Analysts. Most of these samples are purchased by an official sampling officer (appointed in accordance with the requirements of the Act) who is usually either a Public Health Inspector or a Weights and Measures Inspector;

(b) those taken to determine the residue of a specific active ingredient or group of active ingredients in a foodstuff, for the studies recommended by the Panel on Residues of Pesticides in Foodstuffs. The Scientific Subcommittee's Panel on Residues of Pesticides was set up in November 1961. Its terms of reference are now:

> 'To propose selective surveys to determine residues of pesticide and veterinary products in raw and processed foods, both home grown and imported, where these have been applied in commercial practice and to report the results of these surveys to the Scientific Subcommittee or the Veterinary Subcommittee, as appropriate, with recommendations.'

(c) samples representative of the average total diet—also investigated for the Panel on Residues of Pesticides in Foodstuffs.

Often the presence, nature and origin of any residue in these samples is unknown to the analyst. Most of these samples are obtained by informal procedures. The statutory powers relating to sampling are summarised in Appendix 5.

15. Most Public Analysts examine foods for residues of pesticide and veterinary products, but not all of their laboratories are equipped with the apparatus required for some techniques. Samples requiring examination by such techniques are sent to the laboratories possessing the necessary apparatus. At present Public Analysts are conducting a special survey of pesticide residues in food for the County Councils' Association. Samples examined by Public Analysts between 1962 and 1965 are summarised in Appendix 6.

16. Samples are examined on behalf of the Panel on Residues of Pesticides in Foodstuffs in official laboratories. Central Government sampling facilities are very limited. No statutory powers are used to obtain these samples, many of which are chosen because they are expected to contain residues of pesticide or veterinary products. The numbers of samples examined in the years 1962–1966 are summarised in Appendix 6.

17. In Great Britain samples representative of total diets are examined only by official laboratories. However, studies of organochlorine pesticide residues in complete meals prepared in Great Britain have been undertaken by "Shell" Research Ltd.

18. As a quality control measure, processed foods are occasionally examined by some food processing firms and allied Research Associations. Very few of the food firms that answered the press notice examine their raw materials or produce for pesticide or veterinary product residues as a routine. Some firms examine produce if there has been a complaint of taint, or, in the case of animal feeding stuffs, of poor performance. Eleven firms are equipped to do such analyses "if necessary". The Fruit and Vegetable Preservation Research Association is studying the possible association of taint in preserved produce with the use of pesticide products.

19. Samples of agricultural produce are examined for residues by research stations of the Agricultural Research Council and in the regional laboratories of the National Agricultural Advisory Service, during the course of experimental field trials evaluating extensions of the use of established pesticide products for the control of economically important pests and diseases.

Extent to which appropriate analytical methods are available

20. Over 250 sets of official recommendations for the safe use of the active ingredients of pesticide or veterinary products in agriculture, horticulture, food storage, home gardening and animal husbandry, have been issued by the Ministry of Agriculture, Fisheries and Food, on behalf of the Agriculture and Health Departments of the United Kingdom. Recommendations exist for the safe use of some active ingredients, for example diazinon, for each of these purposes in a variety of formulations. Residues of these active ingredients are therefore theoretically possible in a very wide range of foodstuffs. On the other hand, some active ingredients have very restricted uses and in consequence residues of these active ingredients would only be expected to appear in very few foodstuffs.

Insecticides, Fungicides, Herbicides and Acaricides, used in Agriculture, Horticulture, Food Storage or Animal Husbandry

21. The Working Party examined figures for the approximate quantities of individual active ingredients used annually in agriculture and horticulture in Great Britain. It

considered these figures in conjunction with other aspects such as persistence, manner of application, the likely interval between application and harvest, the manner of degradation and mammalian toxicity, in order to judge the need for a method of residue analysis for the harvested or marketed produce.

22. The Working Party also attempted to give the same consideration to individual active ingredients used in the United Kingdom in food storage and veterinary practice. For most of these it was not possible to form a firm opinion of the extent of use. Nevertheless, an attempt was made to assess this extent and to consider it together with agricultural uses (where these exist) and with other factors indicated in paragraph 21 above. From this the Working Party formed a judgment on the need for residue methods.

23. The Working Party further attempted to survey the main overseas uses of active ingredients in so far as these relate to produce imported into the U.K. Some of these uses are indicated in Appendix 7. Many of the active ingredients used on imported foods are also widely used in Great Britain and often on the same kind of food. Again there was difficulty in assessing the extent of these uses, but account was taken of the limited data available when considering the need for and availability of residue methods. The Working Party agreed with the view expressed to the Advisory Committee (*para. 156) that more information on the extent of use of pesticide and veterinary products was needed. The Working Party *recommends* that the enquiries into the use of insecticides, fungicides, herbicides, acaricides, bacteriostats, coccidiostats, anthelmintics, drugs for use against histomoniasis and growth promoters on foodstuffs imported into Great Britain should be extended and that this information together with that being collected on uses in Great Britain should be made generally available.

24. The active ingredients considered by the Working Party are listed in Appendix 8. Where it was thought that there was a need for a method of analysis for residues, the methods at present published were critically appraised. Adequate analytical methods are available for all the active ingredients for which additional residue data were considered necessary, except for dithiocarbamates. It is known that methods that have not been published are available for the determination of some metabolic derivatives. The Working Party supports the Advisory Committee's recommendations (*para. 72) for the early publication of residue analytical methods.

25. As the result of the considerations outlined in paragraphs 21–24 above, the Working Party is of the opinion that so far as the measurement and detection of residues of those active ingredients applied to food in the course of production or storage is concerned:

(a) adequate analytical methods are in general available where the identity of the active ingredient used is already known;

(b) adequate analytical systems are also available for the detection and measurement of individual active ingredients in most of the important groups of active ingredients, the use of which need not specifically be known at the time of analysis, e.g. organochlorine insecticides, chlorophenoxy aliphatic acid and triazine herbicides, and a large number of the organophosphorus insecticides;

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* 'Review of the Present Safety Arrangements for the Use of Toxic Chemicals in Agriculture and Food Storage'. Report of the Advisory Committee on Pesticides and Other Toxic Chemicals. H.M.S.O., 1967.

(c) there are limitations in the extent to which individual analytical methods can be combined into a single method or scheme of general analysis for operation on a routine basis but development work should continue, for such schemes would be of the greatest possible value for the rapid examination of perishable foodstuffs, the pesticide treatment of which is unknown;

(d) for certain active ingredients there is a need for simpler and quicker means for the independent and unambiguous identification of the residues detected, e.g. dithiocarbamates, certain fungicides and herbicides, some of the organophosphorus insecticides, and unchanged halogenated fumigants;

(e) there is a need for further information regarding the identity and extent of some breakdown products, e.g. of dithiocarbamates, carbamates and certain of the organophosphorus insecticides.

Other Veterinary Products (bacteriostats, coccidiostats, anthelmintics, drugs for use against histomoniasis, growth promoters)

26. For most of these veterinary products it was not possible to form a firm opinion of the extent of use in Great Britain. No information is available on the active ingredients used or the extent of their use on animals from which foodstuffs imported into Great Britain are derived. Apart from some antibiotic residues in milk, there is little or no evidence of the extent to which residues of these veterinary products occur in foods. A consideration of persistence, method of use and mammalian toxicity indicated that there was no likelihood of toxic hazard to humans consuming foods derived from treated animals, but there might be a possibility of resistant strains of pathogens developing in the human body owing to the consumption of residues of antibiotics. Appendix 9 gives the list of active ingredients considered by the Working Party. Residue methods were considered to be needed in connection with the present scale of use for arsanilic acid, carbarsone, chloramphenicol, dihydrostreptomycin and thyroxine.

27. Where it was considered that there was a possibility of residues of these veterinary products passing into foodstuffs derived from treated animals the Working Party concluded:

(a) adequate methods are in general available for the active ingredient, but not necessarily for metabolic derivatives, where the identity of the active ingredient used is already known;

(b) there is a need for tests, such as those available for antibiotics, for use on samples of unknown treatment to indicate the presence of the residues of other classes of active ingredients used in veterinary practice such as coccidiostats, anthelmintics, drugs for use against histomoniasis, certain bacteriostats, and growth promoters;

(c) there is a need for further information regarding the identity and occurrence of any toxic metabolic derivatives of these veterinary products.

Further work needed

28. The Working Party recommends that further work should be done on:

(a) the further development of general schemes of analysis for 'unknown' residues of insecticides, fungicides, herbicides and acaricides (para. 25 (c));

(b) the development of simpler and quicker means for the independent and unambiguous identification of certain residues (para. 25 (d));

(c) the identity and the extent of metabolic derivatives of some pesticide and veterinary products (para. 25 (e) and 27 (c)) and the methods for determination of others (para. 27 (a));

(d) the development of screening tests for residues of coccidiostats, anthelmintics, drugs for use against histomoniasis and growth promoters (para. 27 (b)).

The Basis for Sampling to obtain sufficient data for a proper consideration of Residue Limits

29. Residues of pesticide and veterinary products in foods can arise from three distinct circumstances:

(a) the foodstuff receives an intentional, approved, treatment at some stage in its production or storage;

(b) the foodstuff at some stage in its production comes into contact with residues resulting from an intentional, approved use of the pesticide product other than directly on the foodstuff. Examples of this are the contamination of crops by residues resulting from the treatments given to previous crops, assimilation by animals of residues in treated fodder crops and indirect contamination of foodstuffs following the use of pesticide products on or in processing or storage premises, transporting containers or packing materials;

(c) the foodstuff comes into contact with the pesticide accidentally or as a result of deliberate malpractice. Examples which have occurred are contact of foodstuffs with formulated pesticide products during transport, spraying of the wrong field, accidental or deliberate use of an incorrect pesticide product on a crop and admixture of dust formulations with animal feeding stuffs in mistake for additives of similar appearance.

30. It is only possible to investigate systematically residues resulting from circumstances (a) and (b) above. Residues due to gross accidental misuse have been, and will probably continue to be, detected because of a resultant adverse effect such as the falling off of performance in animals, the detection of taint in foodstuffs, or because mistreatment is known or suspected to have occurred.

31. Residues arising from circumstances such as those indicated in (c) above cannot be taken into account when considering any system of residue limits and the Working Party did not consider this problem further.

32. Data on the occurrence of direct and indirect residues in raw and processed foodstuffs can be obtained from samples taken at any of the following points:

(a) when leaving the production stage i.e. at harvest, slaughter or factory;

(b) during and after storage;

(c) after transportation e.g. at the dock-side;

(d) during retail distribution;

(e) after preparation for consumption e.g. restaurant meals, whole diet samples.

33. The most important criterion for a consideration of toxic hazards is the amount of residue present in food as consumed. However, other considerations such as ease of sampling, reduction of the complexities of analysis, reduction of the number of samples to be analysed and the correlation of residue levels with treatment, may make it more convenient for samples to be taken at other stages.

34. No generalised scheme of sampling can be recommended for all foodstuffs. Statistical advice should be sought when designing any particular study, and consideration should be given to factors such as the use of other, similar, active ingredients on the foodstuff and the importance of the foodstuff in the general diet. It is probable that some further work will be needed in developing techniques of sampling, e.g. in field and animal crops, and in bulk supplies.

35. The Working Party recognised three possible approaches to the sampling and analysis of a specific foodstuff:

(a) selective sampling of batches known to have been treated with a particular pesticide or veterinary product and examination of these samples for residues of the active ingredient or its derivatives;

(b) random sampling of the foodstuff and analysis for residues of pesticide or veterinary products that are recommended for use on, or are known to be used on, the foodstuff;

(c) random sampling of the foodstuff followed by screening for residues of the various groups of active ingredients, irrespective of the known or recommended uses of these active ingredients.

36. The Working Party *recommends* that samples to provide data for the consideration of residue limits for home produced foodstuffs should, where possible, be taken when, or immediately after, the foodstuff leaves the stage at which the treatment responsible for the residue under investigation is applied.

37. The Working Party recognised that for a given crop and pesticide the residues arising from good agricultural practice (i.e. that which achieves the desired technological advantage with the minimum of residue in the ultimate produce) might differ from one country to another. For this reason higher, but toxicologically acceptable, residues could occur in imported foodstuffs than arise from good agricultural practice in Great Britain. It is unlikely that detailed information on the active ingredients used and the dates and rates of application would be available for individual consignments. Hence it could not be said whether the residues found by analysing the food when it reached this country were the result of good practice or not. The Working Party therefore felt that data for a consideration of residue limits in imported foodstuffs based on good agricultural practice could not always be derived solely from analysis of samples taken when the foodstuff enters this country.

38. The Working Party was advised that international trade agreements do not permit discrimination between imports and home produce on technical grounds. At the same time the home producer would expect to be fairly treated in respect of residue limits, so that different residue limits for imported and for home produced foodstuffs could not in equity be sustained. Where a foodstuff was imported and also produced at home, some compromise between the residue levels resulting from good agricultural practice at home and overseas might be necessary in establishing limits. The Working Party recognised that such compromises were beyond its terms of reference but *recommends* that the imported foodstuffs/pesticide combinations to which these considerations apply should be established.

39. The Working Party *recommends* that where possible samples of imported foodstuffs should be taken at the point of entry into this country to provide data for consideration of residue limits.

40. Where imported foodstuffs are treated after importation into Britain, the Working Party *recommends* that samples to provide data for the consideration of limits of residues resulting from this treatment should be taken when the food is leaving the stage in its distribution in which the treatment has been applied.

41. Total diet studies are valuable for testing conclusions based upon the results of analysis of foodstuffs at earlier stages. The results from such studies have not so far indicated any discrepancy with the residue situation as indicated by the intensive studies of samples from the producer, processer or retailer. The Working Party *recommends* that total diet studies should continue.

Additional Analytical and Sampling Facilities

42. The Working Party interpreted item (d) of its terms of reference to refer to the facilities required to obtain sufficient information about residues of pesticide and veterinary products at present in commercial use for a proper consideration of residue limits. The Working Party supports the Advisory Committee's recommendations (*para. 70–71) that equivalent information should be provided by industry for all new active ingredients or new uses at the time when these first become generally available, supported if required by further data during the early years of commercial use. The Working Party *recommends* that industrial and other scientists should be encouraged to publish the results of residue determinations on samples from commercial scale field trials as promptly as possible.

43. The Working Party is of the opinion that sufficient data, published and unpublished, may already be available for a proper consideration of limits for a large number of pesticide and veterinary products. The Working Party *recommends* that the adequacy of these data for this purpose be examined.

44. During its reviews of the uses of pesticide and veterinary products, the Advisory Committee may require additional data on uses of those active ingredients which came into general use before the inception of the present Safety Schemes (the so called backlog chemicals) and of active ingredients already cleared under the Pesticides and Veterinary Products Safety Precautions Schemes. It is the Working Party's opinion that it must be the Government's responsibility to obtain such data, but industry should be encouraged to contribute to the additional data required.

45. To investigate all foods for residues of all possible active ingredients under all possible conditions of use would be a prodigious and unrewarding task. The Working Party estimates that it would take several years of intensive work even with an increased staff to obtain such information and that in the interval the pattern of use of pesticide and veterinary products may have altered considerably.

46. Only a few of the active ingredients of pesticide and veterinary products at present in use give rise to indirect residues of the kind described in paragraph 29(b). Levels of such indirect residues have almost invariably been found to be very low. On the other hand the less easily controlled methods of application, such as vaporisers, can result in

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* 'Review of the Present Safety Arrangements for the Use of Toxic Chemicals in Agriculture and Food Storage'. Report of the Advisory Committee on Pesticides and Other Toxic Chemicals. H.M.S.O., 1967.

high residues. The Working Party considered that systematic examination of foodstuffs to determine the extent of the occurrence of residues from such causes is valuable but that limits, if required, may have to be based on other factors in addition to the levels found.

47. As indicated in paragraphs 22 and 23 above, the Working Party has found it difficult to obtain accurate and up-to-date information on the extent of use of individual pesticides and veterinary products, both in Britain and overseas. However, using the best information available to it, the Working Party has drawn up the tabular evaluations of these aspects set out in Appendices 8 and 9 and has used this information in the further considerations set out in Appendices 10 and 11.

48. The Working Party considered the pesticides listed in Appendix 8 and the Veterinary products in Appendix 9 and concluded that, on the basis of the arguments set out in Appendices 10 and 11, the following active ingredients warranted further investigation in relation to the residues arising from their use on home produced foodstuffs at the present time:

aldrin/dieldrin
arsanilic acid
azinphos-methyl
gamma-BHC
carbarsone
carbaryl
carbophenothion
chlorpropham/propham
  (as potato sprout inhibitors)
DDT
dichlofenthion
dicofol
dinocap
dinoseb
dithiocarbamates (including ferbam,
  manam, maneb, thiram, zineb, ziram)
endosulfan
endrin
TDE

49. Of the home produced foodstuffs in which residues of these active ingredients are likely to occur, the Working Party considered that there were sufficient data on organochlorine pesticide residues in carrots, potatoes, butter and beef fat.

50. The Working Party *recommends* that further residue data on home produced foods should be obtained as follows:

aldrin/dieldrin gamma BHC DDT	in foodstuffs except carrots, potatoes, butter, beef fat
azinphos-methyl dinocap	on glasshouse crops
endosulfan	on blackcurrants
dicofol TDE	on strawberries and apples
chlorpropham/propham	on potatoes (when used as sprout inhibitors)
arsanilic acid	in pig meat, poultry eggs
carbophenothion	in mutton
carbarsone	in poultry
dichlofenthion	in mutton

51. Should the present uses of some established active ingredients which have been cleared under the Pesticides and Veterinary Products Safety Precautions Schemes be

greatly increased, the situation should be reviewed and new residue studies initiated if considered necessary.

52. In the absence of the more precise information on usage discussed in paragraph 23 and because of the conclusions given in paragraphs 37 and 38, the Working Party was unable to make recommendations on the facilities required for the investigation of residues in imported foodstuffs.

53. About fifty scientific and experimental staff are employed in central government laboratories on all aspects of pesticide and veterinary product residue problems. Of this staff, about half are involved with the analysis of samples of human foodstuffs. A substantial part of the present facilities is thus committed to other aspects of problems arising from the use of pesticides, such as the examination of human and wild-life tissues and the improvement of analytical techniques. The Working Party considered that if the recommendation in paragraph 50 is accepted, central government analytical facilities, if fully staffed and directed entirely to implementing this recommendation, would be adequate for the work proposed. The Working Party did not consider it to be within its terms of reference to make recommendations as to the relative priority which should be accorded to residue work on foodstuffs, human tissues and wild life tissues.

54. The Working Party thus considered that no immediate increase of central government analytical facilities would be necessary unless the data from the studies recommended in paragraph 50 were required with extreme urgency (e.g. within two years from the start of the work). At the same time the Working Party noted that legal limits for pesticide residues were being (or had recently been) established in many European countries and that residue tolerances were also being considered by the FAO/WHO Codex Alimentarius Commission. The Working Party recognises that this situation might ultimately necessitate an increase in analytical and sampling facilities.

55. Central government authorities have no official sampling arrangements, formal or informal, for the purposes under discussion and would not be able to increase, or even maintain, their present scale of informal sampling unless staff were made available for this purpose. If formal samples were required to be taken by central government officers their powers, and the procedures to be adopted, would have to be defined.

56. The Working Party *recommends* that a small group be formed to undertake sampling for studies initiated by central government authorities.

57. Analytical facilities available to local government are primarily concerned with the enforcement of various statutes. Both formal and informal samples are taken for this purpose. If it is accepted that it is a central government responsibility to obtain the required data it might be difficult to use facilities which are financed by local authorities.

58. If local government sampling officers were required to obtain samples for residue limit data studies, funds would have to be made available for this purpose. If formal samples were required the powers of the sampling officers might need to be reviewed.

The Kind of Organisation needed for a prolonged Survey of Residues

59. The Working Party considered that it would be a misapplication of valuable and limited official resources to attempt a continuous survey of residues of all pesticide and veterinary products in all foodstuffs. More valuable information would be obtained

from a series of intensive surveys related to specific aspects of pesticide and veterinary product usage.

60. The activities of the appropriate local authorities in Britain, if carried out on an extended scale, could serve to indicate the general levels of residues and any undesirable trends. Information on the amounts and types of pesticide and veterinary products used on foodstuffs, both home produced and imported, would also indicate areas in which special effort should be directed.

61. The Working Party *recommends* that a co-ordinating body be appointed by the Scientific and Veterinary Subcommittees jointly with terms of reference which should include the following:

(a) to keep under review all information relating to the levels of the active ingredients of pesticide and veterinary products and their derivatives of toxicological significance in human food in Great Britain, both home produced and imported; and to co-ordinate and disseminate such information;

(b) to propose and arrange surveys, selective or otherwise, to determine the levels of residues of the active ingredients of pesticide and veterinary products and their toxic derivatives in human foods in Great Britain where it is considered that more residue information is desirable;

(c) to propose and arrange surveys to determine the levels of residues of the active ingredients of pesticide and veterinary products and their toxic derivatives in aspects of the environment other than food where appropriate to the consideration of limits for specific residues in food;

(d) to co-ordinate the activities of the sampling group and the analytical laboratories undertaking the surveys recommended under items (b) and (c);

(e) to report conclusions and recommendations arrived at under items (a), (b) and (c) and the results of studies to the two Subcommittees.

62. The Working Party *recommends* that, if formed, the new body referred to in paragraph 68 should replace the present Panel on Residues of Pesticides in Foodstuffs. The Working Party further suggests that when the membership of this body is being considered, invitations should be extended to the Agricultural Research Council, the Medical Research Council and the Association of Public Analysts to nominate suitable persons. Consideration should also be given to the clerical support that may be required by the secretariat of the new body to assist with the arrangements for the collection of samples, collation of data and the collection and dissemination of information on the use of pesticide and veterinary products on imported foods.

Summary of Recommendations

63. The Working Party recommends that:

Information

(a) further information on the use of pesticide and veterinary products in or on foodstuffs imported into Great Britain should be collected, and, together with corresponding information on home produced foodstuffs, should be kept up to date and made generally available [para. 23];

(b) industrial and other workers should be encouraged to publish results of residue studies on commercial scale field trials as soon as possible [para. 42];

Further Work Needed

(c) further work is required on the development of general schemes of analysis for 'unknown' residues of insecticides, fungicides, herbicides and acaricides [para. 28 (a)];

(d) further work is required on the development of simpler and quicker means for the independent and unambiguous identification of certain residues [para. 28 (b)];

(e) further work is required on the identity and the extent of some pesticide breakdown products and the methods for the determination of others [para. 28 (c)];

(f) further work is required on the development of screening tests for residues of coccidiostats, anthelmintics, drugs for use against histomoniasis and growth promoters [para. 28 (d)];

Residues Data

(g) data upon which limits of residues in home produced and imported foodstuffs could be based should be derived from samples taken as the foodstuff is leaving the stage of production or distribution at which the treatment responsible for the residues is applied, or in the case of imports at the point of entry into this country [para. 35, 39 and 40];

(h) individual foodstuffs which are both home produced and imported and which may be treated with the same active ingredients at home and overseas should be identified, together with the active ingredients so used [para. 38];

(i) studies on the residues occurring in foodstuffs in the total diet as available for consumption should be continued [para. 41];

(j) the adequacy of present residue data, published and unpublished, for a proper consideration of residue limits should be examined [para. 43];

(k) further data on residues of the following active ingredients in the home produced foods indicated should be obtained:

  (i) aldrin/dieldrin, gamma BHC and DDT in foodstuffs other than carrots, potatoes, butter, beef fat
  (ii) azinphos-methyl and dinocap on glasshouse crops
  (iii) endosulfan on blackcurrants
  (iv) dicofol and TDE on strawberries and apples
  (v) chlorpropham/propham on potatoes
  (vi) arsanilic acid in pig meat, poultry and eggs
  (vii) carbophenothion in mutton
  (viii) carbarsone in poultry
  (ix) dichlofenthion in mutton
  [para. 49];

Analytical and Sampling Facilities

(l) a unit should be set up to be responsible for the collection of samples for residue studies initiated by central government authorities [para. 53];

Co-ordination of Activities

(m) a new body should be appointed to take over the work of the present Panel on Residues of Pesticides in Foodstuffs and to co-ordinate all aspects of the collection of residue data in foodstuffs [para. 60 and 61].

APPENDIX 1

Membership of the Working Party on the Collection of Residue Data

H. Egan, Esq., B.SC., PH.D., D.I.C., F.R.I.C. (Chairman)

D. C. Abbott, Esq., B.SC., PH.D., F.R.I.C.

J. A. R. Bates, Esq., B.SC., F.R.I.C.

M. Burdin, Esq., B.SC., M.R.C.V.S. (Until June 1966)

J. H. Hamence, Esq., M.S., PH.D., F.R.I.C.

G. A. Hamilton, Esq.

A. F. Machin, Esq., B.SC. (From June 1966)

R. C. Spalding, Esq., M.A., F.R.I.C.

R. H. Thompson, Esq., B.SC., A.R.C.S., D.I.C., A.R.I.C.

D. F. Lee, Esq., B.SC. (Secretary)

P. N. M. Moore, Esq., also attended meetings by invitation.

APPENDIX 2

Press Notice issued on 22nd February, 1966

AGRICULTURAL CHEMICALS

(Joint Announcement by the Agricultural Departments in Great Britain)

COLLECTION OF DATA ON RESIDUES OF PESTICIDE AND VETERINARY PRODUCTS

The Advisory Committee on Pesticides and Other Toxic Chemicals has appointed a Working Party to consider the problems associated with the collection of data on residues of pesticide and veterinary products occurring in human food. The Working Party would welcome the co-operation of trade interests, local authorities and other interested bodies in their review and particularly wish to receive evidence on the following points:

(1) what facilities exist for sampling and analysing raw and processed foodstuffs, both home grown and imported, for residues of pesticide and veterinary products;

(2) how far appropriate analytical methods are available.

Such evidence should be sent to the Secretary of the Working Party:
D. F. Lee, Esq., Plant Pathology Laboratory, Hatching Green, Harpenden, Herts., to reach him not later than 26th May, 1966.

NOTES FOR EDITORS

1. The Terms of Reference of the Advisory Committee on Pesticides and Other Toxic Chemicals are as follows:

'To keep under review all risks that may arise from the use of:

(i) pesticides;

(ii) potentially toxic chemicals on sale to farmers for veterinary use and veterinary medicines prescribed for use by veterinary surgeons;

(iii) any other potentially toxic chemical specifically referred to the Committee by Ministers, and to make recommendations to the Ministers concerned.'

2. The Advisory Committee are at present reviewing the present voluntary arrangements for the safe use of pesticides under the following terms of reference:

'To consider and advise on any improvements and extensions of present safety arrangements that may be desirable to provide greater protection against the hazards arising from the use of toxic chemicals in agriculture and food storage; in particular to consider whether stricter criteria should be applied in the approval of new products and the review of the approval of existing products.'

APPENDIX 3

Organisations that replied to the Press Notice

Agricola Chemicals Ltd.
A. J. Amos Consultant Analyst.
Arthur D. Little Ltd.
The Association of the British Pharmaceutical Industry.
The Association of County Councils in Scotland.
The Association of Public Analysts.

Batchelors Foods Ltd.
Baywood Chemicals Ltd.
Beechams Foods Ltd.
Bernard Dyer and Partners.
Boots Pure Drug Co. Ltd.
Bovril Ltd.
Brewing Industry Research Foundation.
British Baking Industry Research Association.
British Food Manufacturing Industries Research Association.
British Industrial Biological Research Association.
British Sales Ltd.
British Sugar Corporation Ltd.

County Borough of Burnley.
Central Veterinary Laboratory.
Chatfield Applied Research Laboratories.
CIBA Laboratories Ltd.
Co-operative Wholesale Society Ltd.
Cooper Technical Bureau.
The Counties of Cities Association.
County Councils Association.
Crookes Laboratories Ltd.
Cyanamid of Great Britain Ltd.

D.A.F.S. East Craigs.
Ditton Laboratory.
Dow Chemical Company (U.K.) Ltd.

East Malling Research Station.
Elanco Products Ltd.

Fisons Pest Control Ltd.
Food Manufacturers Federation Incorporated.
Freshwater Fisheries Laboratory.
Fruit and Vegetable Preservation Research Association.

Glasshouse Crops Research Institute.
Glaxo Laboratories Ltd.

H. J. Heinz Co. Ltd.
Houghton Poultry Research Station.
R. T. Hunter.
Huntingdon Research Centre.
Huntley and Palmer Ltd.

Imperial Chemical Industries Ltd.
Infestation Control Laboratory.

The Laboratory of the Government Chemist.
The Lee Conservancy Catchment Board.
Leeds City Analyst.
Long Ashton Research Station.
J. Lyons and Co. Ltd.

Marine Laboratory.
Marks and Spencer Ltd.
Melling and Arden.
Metropolitan Water Board.
Milk Marketing Board.
Dr. R. F. Milton.
Monsanto Chemicals Ltd.
The Murphy Chemical Co. Ltd.

N.A.A.S. Cambridge.
Nabisco Foods.
National Vegetable Research Station.
The Nestlé Company Ltd.
Nicholas Research Institute Ltd.

Pan Britannica Industries.
Pea Growing Research Organisation Ltd.
Pest Infestation Laboratory.
Pfizer Ltd.
Plant Pathology Laboratory.
Potato Marketing Board.
Poultry Research Centre.

J. A. Radley (Laboratories) Ltd.
Rank-Hovis-McDougal Ltd.
Research Association of British Flour-Millers.
Rothamsted Experimental Station.
T. B. Rymer.

Salmon and Freshwater Fisheries Laboratory.
Schweppes (Home) Ltd.
Scottish Wholesale Society Ltd.
Shell Research Ltd.

Smith, Kline and French Laboratories Ltd.
Spillers Ltd.

Tate and Lyle Ltd.
Torry Research Station.
Tropical Products Institute.

Unit of Experimental Agronomy.
Urban District Councils Association.

T. Wall & Sons (Meat and Handy Foods) Ltd.
Water Pollution Research Laboratory.
Water Research Association.
Weed Research Organisation.
The Wellcome Foundation Ltd.
Wye College.
John Wyeth and Brother Ltd.

APPENDIX 4

The Kinds of Investigation Undertaken by the 59 Organisations Whose Replies to the Press Notice Indicated a Practical Interest in the Analysis of Foodstuffs for Residues of Pesticides and Veterinary Products

	Food industry	Pesticide industry	Government laboratories	Research Associations	Others*
Number of replies	12	14	12	6	15
Type of Analysis					
Samples of known treatment	1	14	9	4	4
Samples of unknown treatment	6	1	8	5	10+
Not doing analysis but could or will be doing so	2	—	—	1	3
Samples analysed for organochlorine pesticides	5	3	11	6	9
Samples analysed for organophosphorus pesticides	1	9	9	4	4
Samples analysed for herbicides	2	9	2	2	2
Other analyses**	2	10	7	6	10
Samples from field trials	—	13	6	3	3
Samples from commerce	7	2	6	4	7
Home produced foodstuffs	4	4	5	5	9
Imported foodstuffs	4	2	5	6	9
Fresh foods	3	12	7	4	9
Processed foods	2	1	1	4	7
Stored products	—	1	5	6	11

* Consultant analyst and local authorities.

** Veterinary products, antibiotics, fungicides, fumigants; taint.

APPENDIX 5

Powers of Sampling under Existing Legislation

Food and Drugs Act, 1955

1. Under Section 91 of the Act, a sampling officer (i.e. an authorised officer of a council or port health authority) may purchase or take a sample of any food at any stage in the chain of distribution. A sampling officer may not, however, except with the consent of the purchaser or at his request, take samples while the food is in course of delivery to the purchaser or after it has been delivered to him.

2. In the Act, 'food' is defined as follows:

> 'food' includes drink, chewing gum and other products of a like nature and use, and articles and substances used as ingredients in the preparation of food or drink or of such products, but does not include:
>
> (a) water, live animals or birds,
> (b) fodder or feeding stuffs for animals, birds or fish, or
> (c) articles or substances used only as drugs.

Although the question is not specifically dealt with in the Act and does not seem to have been decided in the courts, it could be argued that, as humans do not eat growing crops, these cannot be regarded as 'food' within the meaning of the Act and samples of them cannot be taken for analysis. The Act can, however, be brought to bear once the crop has been harvested, so becoming 'food'.

3. If a sampling officer considers that a sample he has taken should be analysed, he is required to submit it for analysis to the public analyst in the area in which he obtained it.

4. Any other person may also submit a sample of food he has purchased to the public analyst for analysis. A fee may be charged for this service.

5. The Minister of Agriculture, Fisheries and Food may (though he has never done so) direct an officer of his Department to procure samples of any specified food and such an officer would have all the powers of a sampling officer.

6. A sampling officer has, on production of a document showing his authority, a right to enter any premises at all reasonable hours for the purposes of the Act. Twenty-four hours notice of intended entry must, however, be given to the occupier in the case of premises used only as a private dwelling.

7. The Act does not lay down the extent to which sampling shall be undertaken by enforcement authorities and this is entirely of the discretion of the chief officer concerned. there are wide variations between different authorities.

Weights and Measures Act, 1963

8. Under Section 32 of the Act, a local weights and measures authority has power to buy, or to authorise an appointed inspector to buy on its behalf any goods for the purpose of determining whether or not the provisions of the Act are being complied with. Under Section 48, an inspector may seize and detain any article which he has reasonable cause to believe is liable to be forfeited under the Act. Under Section 29, he also has power to weigh, measure or count any goods offered for sale and may, if necessary, break open any container. If the goods in the opened container are found to comply with the Act and if the container cannot be resealed without injury to the contents, the inspector must, if requested to do so, buy the goods on behalf of the local weights and measures authority.

Merchandise Marks Acts, 1887 *to* 1953.

9. Under the Acts, the Board of Trade, Local Authorities and others have power to make test purchases to enforce requirements regarding false trade descriptions of goods.

APPENDIX 6

Analysis of Food Samples for Metals and Other Pesticide Contaminants 1962–1966

Table 1. *Numbers of Samples Analysed by Public Analysts*

		Fruit and Tomatoes	Green Vege-tables	Potatoes	Other Vege-tables	Citrus fruit	Miscell-aneous
962	Pb	258	—	8	25	—	181
	As	254	—	35	45	—	138
	Hg	26	—	—	—	—	5
	Cu	—	—	—	—	—	—
	*Other	303	128	11	108	225	29
	Total	841	128	54	178	225	353
1963	Pb	344	—	17	11	—	694
	As	350	—	17	11	—	94
	Hg	8	—	8	7	—	8
	Cu	327	—	—	—	—	—
	*Other	604	290	89	175	277	159
	Total	1633	290	131	204	277	955
1964	Pb	248	—	—	31	—	—
	As	248	—	—	31	—	—
	Hg	120	—	—	11	—	—
	Cu	—	—	—	—	—	—
	*Other	784	248	50	120	286	108
	Total	1400	248	50	193	286	108
1965	Pb	313	—	—	—	—	1
	As	302	—	9	—	—	3
	Hg	100	—	—	—	—	—
	Cu	—	—	—	—	—	—
	*Other	776	246	45	170	169	237
	Total	1491	246	54	170	169	241
TOTAL	1962/65	5365	912	289	745	957	1657

Notes: Pb — lead
As — arsenic
Hg — mercury
Cu — copper

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* organic insecticides, fungicides.

*Table 2. Numbers of Samples Analysed at Official Laboratories**

		1962	1963	1964	1965	1966
Fruit	OC	—	—	4	15	40
	Br	—	—	—	6	4
	OP	—	4	21	—	—
Apples	Pb/As	46	42	73	56	—
Vegetables	OC	37	218	99	1445	164
	OP	—	10	24	62	92
	Br	—	—	—	4	—
Eggs	OC	—	—	—	78	179
Poultry	OC	—	—	—	56	51
Mutton fat	OC	93	20	156	151	165
Other fats	OC	—	12	85	81	89
Corned beef	OC	—	4	20	26	2
Milk	OC	10	60	60	85	103
Butter	OC	62	27	132	127	155
Wheat	OC	—	—	—	46	12
	OP	48	38	57	186	90
	Br	—	—	—	46	12
Other cereals	OC	—	—	—	3	—
	OP	—	—	—	5	55
	Br	—	—	1	29	78
Nuts, pulses	OP	12	—	—	—	—
	Br	—	—	24	54	51
Miscellaneous	OC	—	—	—	—	40

Notes: OC — organochlorine
OP — organophosphorus
Br — inorganic bromide
Pb/As — lead and arsenic

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* Ministry of Technology, Laboratory of the Government Chemist; Ministry of Agriculture, Fisheries and Food, Plant Pathology Laboratory; Ministry of Agriculture, Fisheries and Food, Infestation Control Laboratory; Department of Agriculture and Fisheries for Scotland, Agricultural Scientific Services Laboratory.

APPENDIX 7

Use of Pesticide and Veterinary Products on Foodstuffs Imported into Great Britain

The following information is abstracted from answers to a series of questionnaires sent out by the Panel on Residues of Pesticides in Foodstuffs, and from the files of the Infestation Control Laboratory.

The active ingredients have been divided into two groups:

List A consists of active ingredients that are also widely used in Great Britain;

List B consists of all the other active ingredients mentioned in the answers. Some of these are used to a limited extent in Great Britain. There is no indication of the extent of use of any of these active ingredients.

LIST A

Pesticide	**Country**	**Foodstuffs**
Aldrin	Italy	potatoes
	Australia	beef
	Australia	mutton
	U.S.A.	apples
Aluminium phosphide	Australia	wheat
Azinphos-methyl	N. Zealand	apples
	Australia	apples, pears
	U.S.A.	apples
BHC and lindane	Uruguay	beef
	Argentina	mutton
	Malagasy	peas, beans
	Jugoslavia	beef, pork
	Italy	potatoes
	Spain	grapes
	N. Zealand	apples
	Australia	apples, pears
	Australia	beef
	Australia	mutton
	Sweden	pork
	Italy	pears
	Jersey	tomatoes
	U.S.A.	apples
Calcium cyanide	France	wheat
	Australia	wheat

Pesticide	Country	Foodstuffs
Captan	Spain	tomatoes
	N. Zealand	apples
	Spain	grapes
	Australia	apples, pears
	Spain	apricots
Carbaryl	Spain	tomatoes
	Spain	potatoes
	Spain	grapes
	N. Zealand	apples
	Australia	pears
	Spain	plums
	Australia	beef
	Italy	pears
	Italy	plums
	Italy	peaches
	Italy	cherries
	U.S.A.	apples
Copper salts	Guernsey	tomatoes
	Spain	tomatoes
	N. Zealand	apples
	Cyprus	potatoes
	Italy	potatoes
	Spain	grapes
	W. Indies	bananas
	Australia	apples, pears
	Spain	apricots
	Australia	mutton
	Italy	plums
	Italy	peaches
	Italy	cherries
DDT	Malawi	nuts
	Australia	apples, pears
	Ireland	beef, pork
	Cyprus	potatoes
	Spain	citrus fruit
	Italy	potatoes
	N. Zealand	apples
	Australia	beef
	Australia	mutton
	Sweden	pork
	Jersey	tomatoes
	U.S.A.	apples
Demeton-methyl	N. Zealand	apples
	Australia	apples, pears
	U.S.A.	apples

Pesticide	**Country**	**Foodstuffs**
Dieldrin	Argentina	mutton
	Italy	potatoes
	Jamaica	bananas
	Australia	apples
	Australia	beef
	Australia	mutton
	Uruguay	beef
	U.S.A.	apples
Dimethoate	N. Zealand	apples
	Australia	apples, pears
	Guernsey	tomatoes
	Jersey	tomatoes
Dinocap	N. Zealand	apples
	Israel	citrus fruit
	Australia	apples, pears
Dithiocarbamates maneb, mancozeb, metiram, nabam, thiram, zineb, etc.	Guernsey	tomatoes
	Spain	tomatoes
	N. Zealand	apples
	Israel	citrus fruit
	Spain	grapes
	W. Indies	bananas
	Cyprus	potatoes
	Italy	potatoes
	Australia	apples, pears
	Spain	apricots
	Italy	plums
	Italy	peaches
	Italy	cherries
	Netherlands	tomatoes
	Jersey	tomatoes
DNOC	Italy	pears
	U.S.A.	apples
Dodine acetate	N. Zealand	apples
	Australia	apples, pears
Endosulfan	U.S.A.	apples
Endrin	Australia	apples
	U.S.A.	apples
Lead arsenate	Canada	apples
	Italy	potatoes
	N. Zealand	apples
	Australia	apples, pears
	Spain	tomatoes
	U.S.A.	apples

Pesticide	**Country**	**Foodstuffs**
Malathion	Spain	tomatoes
	Spain	citrus fruit
	Australia	apples, pears
	Spain	apricots
	Spain	plums
	Australia	beef
	Australia	mutton
	Australia	wheat
	Guernsey	tomatoes
	Jersey	tomatoes
	U.S.A.	apples
	Argentina	wheat
Menazon	Australia	apples, pears
	Spain	plums
	Spain	tomatoes
Mercury compounds	N. Zealand	apples
	Australia	apples, pears
	Australia	mutton
	Jersey	tomatoes
Methyl bromide	Algeria	dates
	France	nuts
	Ghana	cocoa
	Greece	currants, figs
	India	nuts, ricebran
	Iraq	dates
	Iran	dates
	Mexico	maize
	Morocco	nuts
	Nigeria	cocoa, groundnuts
	Spain	dried fruit, nuts
	Tunisia	dates
	Turkey	figs
	U.S.A.	rice, dried fruit, nuts
Phosphamidon	U.S.A.	apples
Pyrethrum	Ireland	beef, pork (premises)
	Australia	beef
	Australia	mutton
TDE 'Rothane'	U.S.A.	apples
Tetradifon	N. Zealand	apples
	Australia	apples, pears

LIST B

Pesticide	**Country**	**Foodstuffs**
Arsenic Trioxide	Australia	beef
	Australia	mutton
	Uruguay	beef
Binapacryl	Israel	citrus fruit
	Australia	apples, pears
Borax	Australia	apples
Carbophenothion	Australia	pears
	Australia	beef
	Argentina	cattle
Chlordane	Australia	beef
	Australia	mutton
	U.S.A.	apples
Chlorfenson	N. Zealand	apples
	Australia	apples, pears
	U.S.A.	apples
Chlorobenzilate	N. Zealand	apples
	Australia	apples
	Australia	pears
	U.S.A.	apples
	Israel	citrus fruit
Coumaphos	Australia	beef
	Australia	mutton
	Argentina	cattle
Diazinon	N. Zealand	apples
	Australia	beef
	Australia	mutton
	Argentina	cattle, mutton
	U.S.A.	apples
Dichlorvos	Australia	beef
	Australia	mutton
Dicofol	Australia	apples, pears
	Italy	pears
	Italy	plums
	Italy	cherries
	Guernsey	tomatoes
	U.S.A.	apples
Dioxathion	Australia	pears
	Australia	beef
	Australia	mutton
	Argentina	cattle

Pesticide	Country	Foodstuffs
Diphenyl	Israel	citrus fruit
	Brazil	citrus fruit
Ethion	Australia	apples, pears
	Australia	beef
	U.S.A.	apples
Fenchlorphos	Australia	beef
	Australia	mutton
Fenthion	Australia	apples, pears
	Australia	mutton
Glyodin	Australia	apples
Mesurol	Australia	apples, pears
Mevinphos	Australia	pears
	U.S.A.	apples
Napthyl acetic acid	Australia	apples, pears
Parathion	Italy	apples
	N. Zealand	apples
	Australia	apples, pears
	Guernsey	tomatoes
	Jersey	tomatoes
	U.S.A.	apples
Phaltan	N. Zealand	apples
o-Phenylphenol	Israel	citrus fruit
Rotenone	Australia	beef
	Australia	mutton
Streptomycin	N. Zealand	apples
Tecnazene	Netherlands	tomatoes
Thiometon	N. Zealand	apples, pears
Toxaphene	Australia	beef
	Argentina	mutton
	U.S.A.	apples
Trichlorphon	Spain	grapes
	Australia	beef
	Australia	mutton
Trithion	Australia	apples, pears
Vamidothion	Australia	apples

APPENDIX 8

Insecticides, Fungicides, Herbicides and Acaricides Used in Agriculture, Horticulture, Food Storage or Animal Husbandry in Great Britain

Key to Symbols Used in Text

Use	
Acaricide	A
Fungicide	F
Herbicide	H
Insecticide	I
Agriculture and horticulture	C
Animal husbandry	B
Food storage	S

Compounds which are used only on a very limited scale have been omitted

Active ingredient	*Use*	*Crops*
Aldrin	IC	Brassicas, hops, barley and wheat, potatoes, strawberries
Aluminium phosphide	IS	Grain
Aminotriazole	HC	Preplanting or pre-sowing
Arprocarb	IS	Treatment of premises against cockroaches and tropical ants
Azinphos-methyl	IAC	Apples, pears, plums, blackberries and loganberries. Tomatoes and cucumbers under glass
BHC and lindane	IC	No restriction
	IS	Treatment of premises. Grain
Butacarb	IB	
Captan	FC	No restriction. Main use on soft fruit, tomatoes, apples and pears
Carbaryl	IC	Apples and pears
Carbon tetrachloride	IS	Grain
Carbophenothion	IB	Sheep
Chlorfenvinphos	IB	Sheep
	IC	Carrots, brassicas, onions, beans, turnips, swedes

Active ingredient	*Use*	*Crops*
Copper salts	FC	No restrictions on use. Used extensively on potatoes also on tomatoes, blackcurrants, celery, cherries and raspberries
Coumaphos	IB	Sheep
Crufomate	IB	Cattle and sheep
Dalapon	HC	No restriction
DDT	IC IS IB	No restriction. Main use on top fruit
Demeton-methyl	IC	No restriction
Desmetryne	HC	No restriction
Diazinon	IAC	No restriction
	IB	Sheep
	IS	Treatment of premises
Dichlofenthion	IB	Sheep
Dichlorvos	IC IB IS	No restriction
Dieldrin	IC	Cereal seed dressing. Potatoes, brassicas
	IS	Treatment of premises against cockroaches and tropical ants
Dimethoate	IAC	No restriction
Dinocap	AFC	No restriction. Main use on apples, hops Crops under glass
Dinoseb (acetate)	IHC	On dormant perennial crops. Pre-crop emergence on potatoes, peas, beans. Post harvest on strawberries. Desiccant on potatoes and legume crops
Disulfoton	IC	Brassicas, carrots, parsnips, potatoes, beet, strawberries, peas and beans
Dithiocarbamates	FC	No restrictions
DNOC	HIC	Post-crop emergence on cereals. Dormant top and bush fruit. Potato haulm destroyer
Dodine acetate	FC	No restriction. Main use on apples, pears and blackcurrants
Endosulfan	IAC	Blackcurrants and strawberries
Endothal	HC	Pre-sowing and pre-crop emergence on beet

Active Ingredients	*Use*	*Crops*
Endrin	IAC	Blackcurrants, strawberries and apples
Ethylene dibromide	IS	Cereals
Ethylene dichloride	IS	Cereals
Ethylene oxide	IS	Cereals, flour, cocoa, spices
Fenchlorphos	IC	Beet
	IB	Sheep, cattle and pigs
Heptachlor	IC	Cereal and sugar beet seed dressing
Hydrogen cyanide	IS	Cereals
Lead arsenate	IC	Apples and pears
Linuron	HC	Potatoes, carrots, beet, beans, peas, parsnips, leeks, maize. Top and bush fruit
Malathion	AIC	No restriction
	IS	Cereals and oil seeds
	IB	No restriction
MCPA (MCPB)	HC	No restriction. Main use on cereals
Menazon	IC	No restriction. Main use on beans, brassicas, potatoes and sugar beet
Mercury compounds	FC	Seed dressing. Apples, pears and tomatoes
Methyl bromide	IS	Cereals, oil seeds, dried and fresh fruit, edible nuts, cocoa.
Phenkapton	AC	Apples, pears, plums and blackcurrants
Phorate	IC	Brassicas, beans, carrots, peas, potatoes, strawberries, maize, beet
Phosphamidon	AIC	Dormant top and bush fruit. Apples, blackcurrants, brassicas, beans, beet, hops, pears, potatoes, strawberries
Propham/chlorpropham	HC	No restriction Potato sprout inhibitor
Pyrazon	HC	Beet
Pyrimithate	IB	Sheep
Simazine	HC	No restriction
Sulphur	FC	No restriction
Tar oil and phenolics	IAC	No restriction. Used on dormant fruit
TDE	IC	Apples, pears, loganberries, raspberries and strawberries
Tetradifon	AC	No restriction
Trichlorphon	IC IB	No restriction

APPENDIX 9

Veterinary Products (bacteriostats, coccidiostats, anthelmintics, drugs for use against histomoniasis and growth promoters) used in Great Britain

Key to Symbols Used in Text

Use	
anthelmintic	A
bacteriostat	B
bacteriostat vs. mastitis	M
coccidiostat	C
growth promoter	G
drugs for use against histomoniasis	H

Compounds which are used only on a very limited scale have been omitted.

Active Ingredient	*Use*	*Animals*
Amprolium	C	poultry
Arsanilic acid	G	pigs and chickens
Bacitracin	M	cattle
Carbarsone	H	turkeys
Cephalosporin analogue		
Chloramphenicol	BM	cattle and sheep
Chlorhydroxyquinoline	B	calves and pigs
Chlortetracycline	GM	pigs and cattle
Clinquinol	B	cattle, sheep and pigs
Cloxaxillin (sodium salt monohydrate)	M	cattle
Dapsone	M	cattle
Diaveridine	C	chickens and turkeys
Dibromopropamidine	M	cattle, sheep and pigs
Dichlorophen	B	cattle
Dihydrostreptomycin	M	cattle
Ethopabate	C	poultry
Framycetin	B	cattle

Active ingredient	*Use*	*Animals*
Furazolidone	B	pigs
Haloxon	A	cattle and sheep
Hygromycin B	G	chickens & pigs
MDMH	B	sheep
Neomycin	M	cattle
Niclosamide	A	sheep
Nitrofurazone	C	pigs and poultry
Novobiocin	M	cattle
Nystatin	B	cattle and poultry
Oleandomycin phosphate	M	cattle
Oxyclozanide	A	sheep
Oxytetracycline	GM	pigs, poultry and cattle
Paraquat	C	poultry
Pencillins	GM	pigs, poultry and cattle
Phenothiazine	A	sheep
Phenzidole	A	sheep
Polymixin B sulphate	M	cattle
Quinacillin	M	
Sodium benzyl pencillin	M	cattle
Spiromycin	M	cattle
Sulphachloropyridazine	B	pigs
Sulphadimidine	BC	poultry
Sulphaphenazole	B	pigs
Sulphaquinoxaline	C	poultry
Sulphathiazole	B	cattle and poultry
Tetramisole	A	pigs
Thiabendazole	A	pigs
Thiostrepton	M	cattle
Thyroxine		milk production cattle and pigs
Tylosin	BG	poultry and pigs
Zoalene	C	chickens and turkeys

APPENDIX 10

Selection of Home Produced Vegetable Crop/Pesticide Product Combinations for Further Residue Work

1. An estimate of the amounts of insecticides, fungicides and herbicides used annually on vegetable crops in Great Britain indicated that the following active ingredients were the most widely used. Within these the extent of use varied from approximately one ton per annum to over 1,000 tons per annum.

Compounds that are widely used in large quantities

Copper salts
Herbicide Mixtures
Lime Sulphur
MCPA
Sulphur

Compounds that are widely used in moderate quantities

Aldrin
Azinphos-methyl
BHC and lindane
Captan
Carbaryl
Dalapon, aminotriazole
DDT
Demeton-methyl
Dieldrin
Dimethoate
Dinocap
Dinoseb
Disulfoton
Dithiocarbamates
DNOC
Dodine acetate
Endothal
Lead arsenate
Linuron
Malathion
Mercury compounds
Phorate
Propham
Pyrazon
Simazine
Tar oil and phenolics
TDE 'Rothane'

Compounds that have only limited use

Desmetryne
Dicofol
Endosulfan
Endrin
Heptachlor
Menazon
Phenkapton
Phosphamidon
Tetradifon

2. Approximately 80% of the total tonnage used is for active ingredients for which the official recommendations for safe use do not specify a minimum interval between last application and harvesting.

The active ingredients are:

aminotriazole
captan
copper compounds
dalapon
DNOC
dodine acetate
endothal
heptachlor
lime sulphur
linuron
MCPA and related herbicides
mezineb (potatoes and hops only)
pyrazon
simazine
sulphur
tar oil
tetradifon

The Working Party regarded the fact that it was not considered necessary to specify an interval as indicating a low consumer hazard from these active ingredients (arising from either low toxicity or manner of use) and therefore recommended that they did not warrant further residues studies at present.

3. A further 2.5% of the total tonnage is of active ingredients for which residues were very low or not detectable when the recommended interval between last application and harvest was observed. These active ingredients with the intervals are:

demeton-methyl (including oxydemeton-methyl and demeton-S-methyl)	three weeks
desmetryne	four weeks
dimethoate	seven days
malathion	one day
menazon	three weeks
phenkapton	three weeks
phorate and disulfton	six weeks
phosphamidon	two (or four) weeks

The Working Party noted that the above (with the exception of desmetryne) were all organophosphorus compounds and that recent surveys both in this country and United States confirmed that residues of these active ingredients could rarely be detected in harvested crops if the recommended interval was allowed to elapse. In most cases the normal use of the product would ensure that the interval would be exceeded in practice. A possible exception would be the use of phorate and disulfoton granules on strawberries but the Working Party was of the opinion that further data would not be worth collecting since the slow release of the active ingredients from the granules would not be likely to give rise to harmful residues.

4. Of the remaining active ingredients legislation* already covers the use of lead arsenate and a recommended limit of 0.1 p.p.m. exists for crops following application of arylmercury sprays and phenylmercury salicylate aerosols.

5. The chemicals left are those which in practice, allowing for the minimum interval being observed, leave residues which need to be assessed toxicologically.

They are:
aldrin/dieldrin
azinphos-methyl
gamma BHC
carbaryl
chlorpropham/propham (as potato sprout inhibitor)
DDT
dicofol
dinocap
dinoseb
dithiocarbamates (including zineb, maneb, mancozeb, manam, ziram, thiram, ferbam, Z.M.C.5)
endosulfan
endrin
TDE

6. The Working Party considered the properties and uses of the active ingredients in paragraph 5, and agreed that azinphos-methyl, carbaryl, dinocap, dinoseb and endrin were used on outdoor crops in such a way that residues should not present a problem. The use of dithiocarbamates as a foliage fungicide on potatoes did not give rise to residues in the tubers. The Working Party regarded the remainder as active ingredients on which further data should be obtained. After a consideration of the uses the following pesticide/crop combinations are proposed for further work.

aldrin/dieldrin gamma BHC DDT	in all foodstuffs
azinphos-methyl dinocap	on glasshouse crops
endosulfan	on blackcurrants
dicofol TDE	on strawberries
dithiocarbamates	when applied directly to the edible crop e.g. tomatoes, blackcurrants, lettuce
chlorpropham propham	on potatoes as sprout inhibitor

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* The Lead in Food Regulations, 1961 (S.I. 1961 No. 1931).
The Arsenic in Food Regulations, 1959 (S.I. 1959 No. 831).

APPENDIX 11

Selection of Home Produced Food/Veterinary Product Combinations for Further Residue Work

It has not been possible to estimate the extent of use of veterinary products in this country, except in a very broad way. The following assessment is made subject to this limitation.

1. It is thought possible that the following active ingredients, used in veterinary practice in this country might give rise to some hazard:

Pesticides
gamma-BHC
butacarb
carbophenothion
chlorfenvinphos
coumaphos
crufomate
DDT
diazinon
dichlofenthion
dichlorvos
fenchlorphos
pyrimithate
trichlorphon

Growth promoters
arsanilic acid

Bacteriostats
chloramphenicol
Streptomycin

Drugs for use against histomoniasis
Carbarsone

2. Of the active ingredients listed, the following seem unlikely to give rise to hazardous residues when used as instructed, either because of their relatively low toxicity and the reasonably rapid elimination of their residues from animal tissues or because they are particularly quickly metabolised and largely excreted:

butacarb
chlorfenvinphos
coumaphos
crufomate
diazinon
dichlorvos
fenchlorphos
pyrimithate
trichlorphon

3. Insufficient information about arsenilic acid and carbarsone is available, although such work as has so far been done suggests that they are unlikely to be a source of danger.

4. The two bacteriostats could be hazardous because of the possibility of their residues contaminating milk. Neither would be detected by the routine tests applied by the Milk Marketing Board. However, chloramphenicol is rapidly excreted and Streptomycin is almost invariably administered with penicillin and the latter would be detected by routine tests. It is therefore concluded that neither compound is likely to give rise to dangerous residues in normal use.

5. It is recommended that residues from the following veterinary products be sought in the foods named:

gamma-BHC and DDT in all animal produce except butter and beef fat
carbophenothion in mutton
dichlofenthion in mutton
arsanilic acid in pig-meat, poultry and eggs
carbarsone in poultry.

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THE COLLECTION OF RESIDUE DATA

Report of the Committee

CORRECTIONS

Page 1, para. 1 Penultimate line *Delete* " 9 ", *insert* " 2 "
Page 1, para. 3 Line 1 *Delete* " 32 ", *insert* " 25 "
Page 2, para. 4 Line 1 *Delete* " 50 & 51 ", *insert* " 40 & 44 "
Page 2, para. 5 Line 2 *Delete* " 70 ", *insert* " 63 "
Page 14, para. 62 Line 2 *Delete* " 68 ", *insert* " 61 "
Page 15, para. 63(k) Last line *Delete* " 49 ", *insert* " 50 "

January 1969

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